WHAT IS CLAIMED IS:

[c01] 1. A rigid die insert for forming and shaping a working material, said rigid die insert comprising a nickel-base superalloy, wherein a plurality of gamma prime particles are uniformly distributed throughout said rigid die insert, and wherein said rigid die insert has a Rockwell hardness, R_c, of between about 48 and about 52.

[c02] 2. The rigid die insert according to Claim 1, wherein said nickel-base superalloy is Rene 95.

[c03] 3. A nickel-base superalloy for forming a rigid die insert, said nickel-base superalloy comprising a Rene 95 alloy and being formed by heating said Rene 95 alloy to a sub-solvus temperature in an inert atmosphere for a first predetermined hold time, quenching said Rene 95 in a room temperature bath, and heating said Rene 95 alloy to a second predetermined temperature for a second predetermined hold time in an inert atmosphere, wherein said nickel-base superalloy has a plurality of gamma prime particles uniformly distributed throughout, and wherein said nickel-base superalloy has a Rockwell hardness, R_c, of between about 48 and about 52.

[c04] 4. The nickel-base superalloy of Claim 3, wherein said sub-solvus temperature is about 2050°F, and wherein said first predetermined hold time is about two hours.

[c05] 5. The nickel-base superalloy of Claim 3, wherein said second predetermined temperature is about 1400°F, and wherein said second predetermined hold time is about 16 hours.

[c06] 6. A rigid die insert for forming and shaping a working material, said rigid die insert comprising a Rene 95 superalloy, wherein said rigid die insert is heated in an inert atmosphere to a sub-solvus temperature of said Rene 95 superalloy for a first predetermined hold time, quenched in a room temperature bath, and heated in an inert atmosphere to a second predetermined temperature for a second

predetermined hold time, wherein said rigid die insert has a plurality of gamma prime particles uniformly distributed throughout, and wherein said rigid die insert has a Rockwell hardness, R_c, of between about 48 and about 52.

[c07] 7. The rigid die insert of Claim 6, wherein said sub-solvus temperature is about 2050°F, and wherein said first predetermined hold time is about two hours.

[c08] 8. The rigid die insert of Claim 6, wherein said second predetermined temperature is about 1400°F, and wherein said second predetermined hold time is about 16 hours.

[c09] 9. A method of treating a rigid die insert to reduce crack propagation and raise yield stress therein, the rigid die insert comprising a nickel-base superalloy having a plurality of gamma-prime particles, each of the gamma-prime particles having a particle size, the method comprising the steps of:

a) providing the rigid die insert;

b) dissolving larger gamma-prime particles in the rigid die insert; and

c) growing additional gamma-prime particles of smaller particle size in the rigid die insert,

whereby the particle size of each of the plurality of gamma-prime particles is refined, thereby reducing crack propagation and raising the yield stress of the rigid die insert.

[c10] 10. The method of Claim 9, wherein the step of dissolving larger gamma-prime particles comprises the steps of:

a) heat treating the rigid die insert in an inert atmosphere to a first predetermined temperature for a first predetermined hold time, said first predetermined temperature being a sub-solvus temperature; and

b) quenching the rigid die insert in a room temperature bath.

[c11] 11. The method of Claim 10, further including the step of forced-air cooling the rigid die insert after the step of heat treating the rigid die insert to a first predetermined temperature.

[c12] 12. The method of Claim 10, wherein the inert atmosphere is an argon atmosphere.

[c13] 13. The method of Claim 10, wherein the step of quenching the rigid die insert in a room temperature bath comprises quenching the rigid die insert in a room temperature oil bath.

[c14] 14. The method of Claim 9, wherein the step of growing additional gamma-prime particles of smaller particle size comprises aging the rigid die insert in an inert atmosphere to a second predetermined temperature for a second predetermined hold time.

[c15] 15. The method of Claim 14, wherein the inert atmosphere is an argon atmosphere.

[c16] 16. A method of refining the particle size of gamma-prime particles in a Rene 95 superalloy, the method comprising the steps of:

a) providing a Rene 95 superalloy;

b) heating the Rene 95 superalloy in an inert atmosphere to a first temperature, the first temperature being a temperature below a solvus temperature of the Rene 95 superalloy;

c) quenching the Rene 95 superalloy at room temperature in a bath, thereby dissolving larger gamma-prime particles; and

d) aging the Rene 95 superalloy in an inert atmosphere at a second predetermined temperature for a second predetermined hold time, thereby growing additional gamma-prime particles of smaller particle size, whereby a more uniform size distribution of gamma-prime particles is created.

[c17] 17. The method of Claim 16, wherein the step of heating the Rene 95 superalloy in an inert atmosphere to a first temperature comprises heating the Rene 95 superalloy to about 2050°F for about two hours.

[c18] 18. The method of Claim 16, wherein the step of quenching the Rene 95 superalloy at room temperature in a bath comprises quenching the Rene 95 superalloy in a room temperature oil bath.

[c19] 19. The method of Claim 16, wherein the step of aging the Rene 95 superalloy in an inert atmosphere at a second predetermined temperature for a second predetermined hold time comprises heating the Rene 95 into about 1400°F for about 16 hours.

[c20] 20. The method of Claim 16, wherein the inert atmosphere is an argon atmosphere.

[c21] 21. A method of treating a rigid die insert to reduce crack propagation and raise yield stress, the rigid die insert comprising a Rene 95 superalloy having a plurality of gamma-prime particles, each of the gamma-prime particles having a particle size, the method comprising the steps of:

a) providing the rigid die insert;

b) heating the rigid die insert in an inert atmosphere to a first temperature for a first predetermined hold time, the first temperature being a temperature below a solvus temperature of the Rene 95 superalloy;

c) forced-air cooling the rigid die insert;

d) quenching the rigid die insert at room temperature in a bath, thereby dissolving larger gamma-prime particles; and

e) aging the rigid die insert in an inert atmosphere at a second predetermined temperature for a second predetermined hold time,

whereby the particle size of each of the plurality of gamma-prime particles is refined, thereby reducing crack propagation and raising the yield stress of the rigid die insert.

[c22] 22. The method of Claim 21, wherein the step of quenching the rigid die insert in a room temperature bath comprises quenching the rigid die insert in a room temperature oil bath.

[c23] 23. The method of Claim 21, wherein the step of heating the rigid die insert in an inert atmosphere to a first temperature for a first predetermined hold time comprises heating the rigid die insert to about 2050°F for about two hours.

[c24] 24. The method of Claim 21, wherein the step of aging the rigid die insert in an inert atmosphere at a second predetermined temperature for a second predetermined hold time comprises heating the rigid die insert into about 1400°F for about 16 hours.

[c25] 25. The method of Claim 21, wherein the inert atmosphere is an argon atmosphere.